

Name:

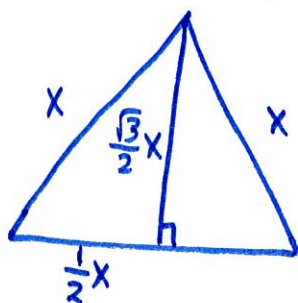
Solutions

1. A line has equation $3x - 4y = -24$. Write a point-slope equation of the line that contains the point $(9, -5)$ and is perpendicular to the first line.

$$\begin{aligned} 3x - 4y &= -24 \\ -4y &= -3x - 24 \\ y &= \frac{3}{4}x + 6 \\ m_1 &= \frac{3}{4} \end{aligned}$$

$$\begin{aligned} (9, -5) \quad m_2 &= -\frac{4}{3} \\ y + 5 &= -\frac{4}{3}(x - 9) \end{aligned}$$

2. Write the height h of an equilateral triangle as a function of its side length x . Then determine the height of an equilateral triangle with a side length of 12 inches.



$$h(x) = \frac{\sqrt{3}}{2}x$$

3. Identify the domain and range of the function $f(x) = \sqrt{x-7} + 2$

$$\begin{aligned} D: & [7, \infty) \\ R: & [2, \infty) \end{aligned}$$

4. Identify the domain and range of the function $w(x) = \frac{1}{x+4}$

$$\begin{aligned} D: & (-\infty, -4) \cup (-4, \infty) \\ R: & (-\infty, 0) \cup (0, \infty) \end{aligned}$$

5. Given the piecewise function $f(x) = \begin{cases} -x-2 & \text{if } x < -1 \\ \frac{1}{2}x+1 & \text{if } -1 \leq x < 6 \end{cases}$,

determine the following:

- a. A graph the function

- b. The value of $f(0)$

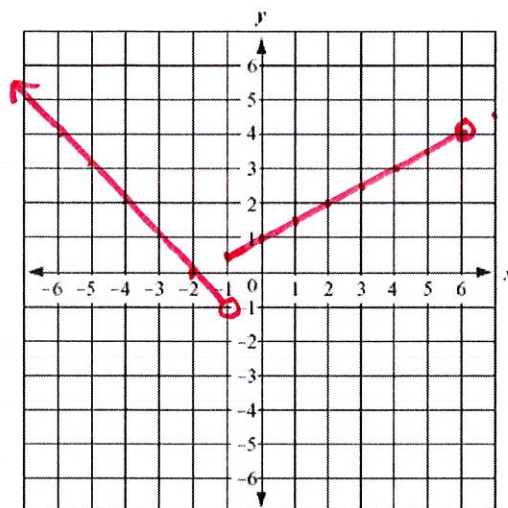
$$f(0) = 1$$

- c. The solutions to $f(x) = 3$

$$x = -5 \text{ or } x = 4$$

- d. If the function is continuous at $x = -1$

No



6. Determine a simplified expression for $f(g(x))$ and give the domain of $f(g(x))$ given the functions $f(x) = 3 - x^2$ and $g(x) = \sqrt{x-5}$

$$f(\sqrt{x-5}) = 3 - (\sqrt{x-5})^2 = 3 - (x-5) = 3 - x + 5$$

$$f(g(x)) = 8 - x \quad D: [5, \infty)$$

7. Determine the zero of the function $f(x) = 10 - 5^x$. Give the zero accurate to three decimal places.

$$0 = 10 - 5^x \quad 5^x = 10 \quad \ln 5^x = \ln 10$$

$$x \ln 5 = \ln 10 \quad x = \frac{\ln 10}{\ln 5} \approx 1.431$$

8. Suppose the half-life of a certain radioactive substance is 100 years and there are 10 grams present initially. When will there be only 4.5 grams of the substance remaining?

$$A(t) = 10 \left(\frac{1}{2}\right)^{\frac{t}{100}} \quad 4.5 = 10 \left(\frac{1}{2}\right)^{\frac{t}{100}} \quad 0.45 = \left(\frac{1}{2}\right)^{\frac{t}{100}}$$

$$\ln(0.45) = \frac{t}{100} \ln\left(\frac{1}{2}\right) \quad \frac{100 \ln(0.45)}{\ln\left(\frac{1}{2}\right)} = t$$

$$t \approx 115.2 \text{ years}$$

9. Determine an equation of the asymptote of the graph of the function $g(x) = e^x - 2$

$$y = -2$$

10. If $k(x) = \ln x - 1$, then determine the inverse function $k^{-1}(x)$.

$$y = \ln x - 1$$

$$y + 1 = \ln x$$

$$e^{y+1} = x$$

$$e^{x+1} = y$$

$$y = e^{x+1}$$

$$k^{-1}(x) = e^{x+1}$$

11. Determine if the function $f(x) = \sqrt{9 - x^2}$ is a one-to-one function. Answer with "yes" or "no" and explain why or why not.

No, $f(x)$ is not one to one since many y -values correspond with two x -values, e.g. $(-2, \sqrt{5})$ and $(2, \sqrt{5})$.

12. Solve the equation $\log_y 27 = \frac{3}{2}$ for y .

$$y^{3/2} = 27$$

$$y = 27^{2/3}$$

$$y = (27^{1/3})^2$$

$$y = 3^2 \quad y = 9$$

13. Solve the equation $\log_2 t + \log_2(t+6) = 4$ for t .

$$\log_2(t^2 + 6t) = 4$$

$$2^4 = t^2 + 6t$$

$$0 = t^2 + 6t - 16$$

$$0 = (t+8)(t-2)$$

$$t = 2, t \neq -8$$

14. Solve the inequality $\log x > 0$ for x .

$$x > 1$$

15. True or False: $\log_n x - \log_n y = \log_n \left(\frac{x}{y} \right)$

True

16. True or False: $\ln p = \frac{\log_2 p}{\log_2 e}$

True

17. Evaluate or simplify the expression $x^{\log_x 20}$. DO NOT USE A CALCULATOR

$$20$$

18. Evaluate or simplify the expression $\ln e^{10}$. DO NOT USE A CALCULATOR

$$10$$

19. Determine which function is an even function and which is an odd function:

a. $g(x) = x^3 - x$

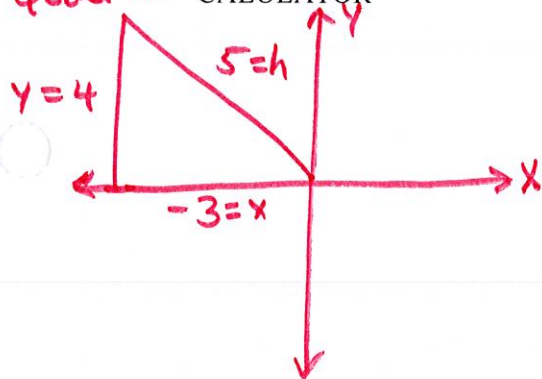
odd function

b. $k(x) = \cos x$

even function

20. Find all the trigonometric values of θ if $\cos\theta = \frac{-3}{5}$ and $\tan\theta < 0$. DO NOT USE A

Quod II CALCULATOR



$$\sec\theta = -\frac{5}{3}$$

$$\sin\theta = \frac{4}{5}$$

$$\csc\theta = \frac{5}{4}$$

$$\tan\theta = -\frac{4}{3}$$

$$\cot\theta = -\frac{3}{4}$$

21. Determine the amplitude, period, phase shift, vertical shift and range of

$$f(x) = -4\sin(3x - \pi) - 2 = -4\sin\left(3\left(x - \frac{\pi}{3}\right)\right) - 2$$

amplitude: 4

vertical shift: 2 down

period: $\frac{2\pi}{3}$

range: $[-6, 2]$

phase shift: $\frac{\pi}{3}$ right

22. Determine the value of each trigonometric expression: DO NOT USE A CALCULATOR

a. $\sin^{-1}\left(\frac{1}{2}\right) = \frac{\pi}{6}$

b. $\cos \frac{\pi}{4} = \frac{\sqrt{2}}{2}$

c. $\cos^{-1}(0) = \frac{\pi}{2}$

d. $\tan \frac{\pi}{2} = \text{undefined}$

e. $\tan^{-1}(1) = \frac{\pi}{4}$

f. $\cos 0 = 1$

g. $\sin \frac{\pi}{2} = 1$

h. $\sin^{-1}(0) = 0$